NPP/ VIIRS Active Fires product description

The NPP Active Fires products are produced by a detection method similar to that used by MODIS. The input to the Active Fires production is Level 1B moderate- resolution reflective band M7 and emissive bands M13 and M15. The fire algorithm first calculates band M13 and band M15 brightness temperature (BT) statistics for a group of background pixels adjacent to each potential fire pixel. These statistics are used to set thresholds for several contextual fire detection tests. There is also an absolute fire detection test based on a pre- set M13 BT threshold. If the results of the absolute and relative fire detection tests meet certain criteria, the pixel is labeled as fire. The designation of a pixel as fire from the results of the BT threshold tests may be overridden under sun glint conditions or if too few pixels were used to calculate the background statistics.

There are multiple fire products. The IDPS operational fire product, NPP_AVAF_L2 (AS 3000 and 3001), contains only a list of pixels where fire was detected. If fire is present within a given granule, the NPP_AVAF_L2 product will contain latitude and longitude, row and column indices, and quality flags for each fire pixel. If no fire is present within the granule, these data fields will not be included in the NPP_AVAF_L2 file. Other Level 2 fire products (NPP_VAFIP_L2 in AS 3001 and 3002, NPP_VAFIRE_L2D in AS 3001) contain two- dimensional fire masks and associated quality information.

There are two versions of the Active Fires algorithm being used to generate NPP fire products. The first is the algorithm that is operating at IDPS, which is used to generate NPP_AVAF_L2 and NPP_VAFIP_L2. This version of the fire algorithm is based on MODIS C4 fire detection methods. The second is the NASA/ NOAA Science Team algorithm based on the MODIS C6 Fire algorithm, which is used to generate NPP_VAFIRE_L2D. All Level 2G and Level 3 DDRs are composited from NPP_VAFIP_L2, so contain data generated by the IDPS algorithm.

NPP_VAFIRE_L2D contains several pieces of information for each fire pixel: pixel coordinates, latitude and longitude, pixel M7 reflectance, background M7 reflectance, pixel M13 and M15 BT, background M13 and M15 BT, mean background BT difference, background M13, M15, and BT difference mean absolute deviation, fire radiative power, number of adjacent cloud pixels, number of adjacent water pixels, background window size, number of valid background pixels, detection confidence, land pixel flag, background M7 reflectance, and reflectance mean absolute deviation.

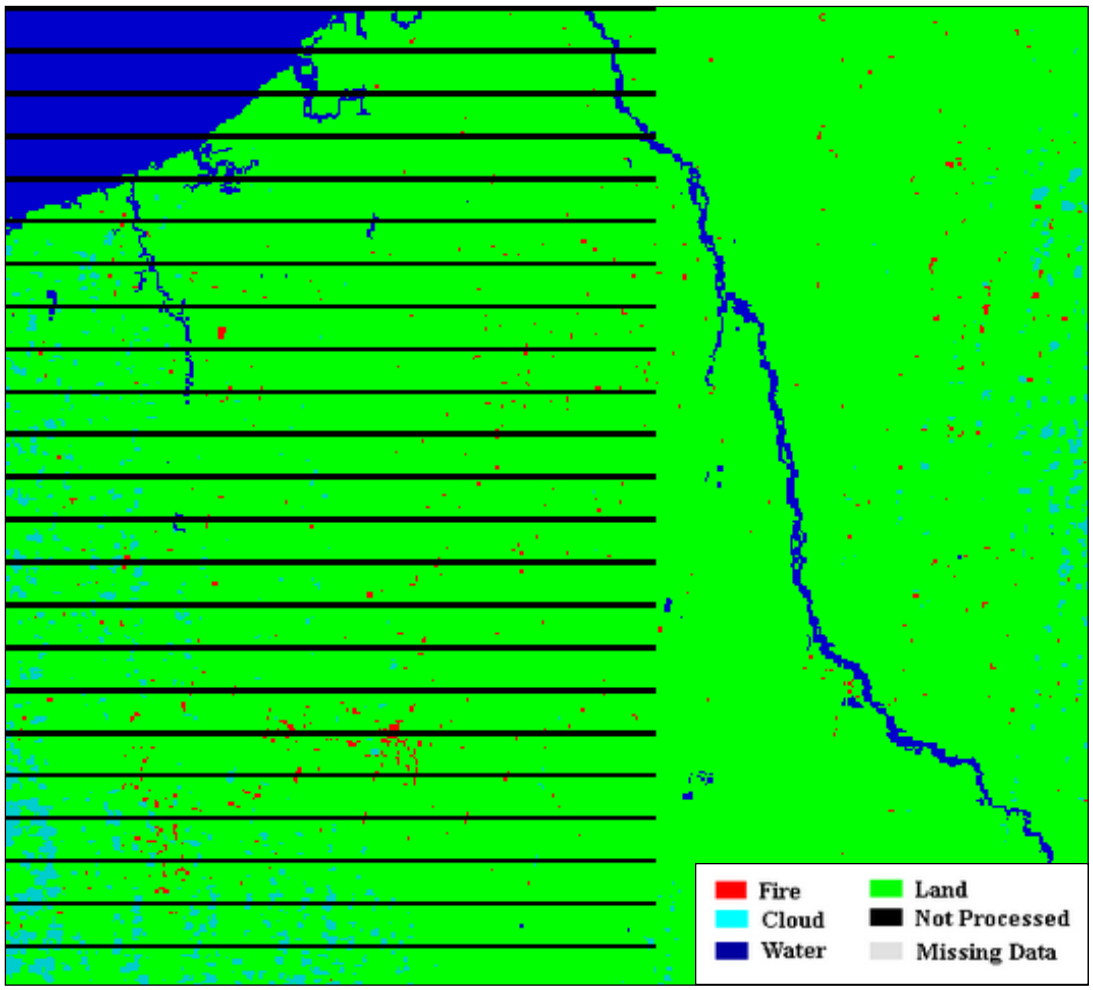

Figure 1: Example of Level 2 fire data. Fires are shown in red. Black areas are bowtie deletion pixels. (Subset of NPP_VAFIP_L2.A2013286.1130.P1_03001.2013286213506.hdf)

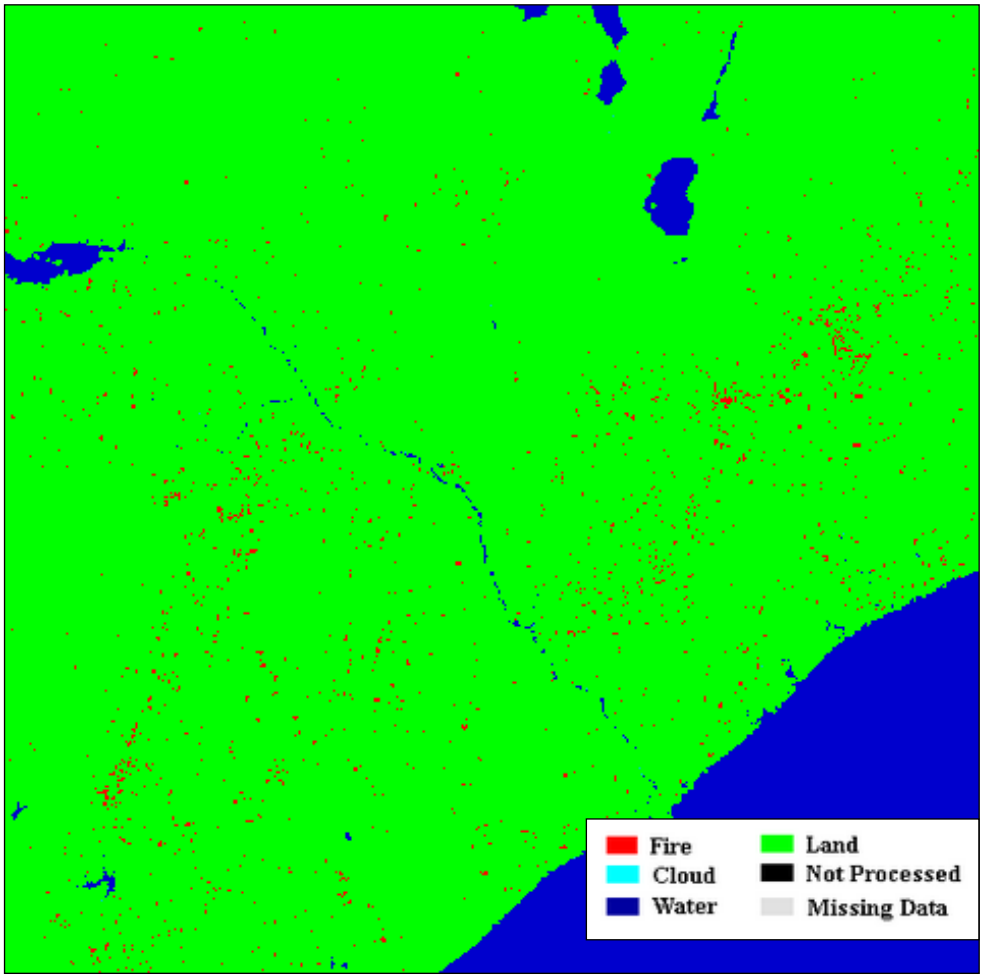

Figure 2: Example of Level 3 8- day composite fire data. Fires are shown in red. (Subset of NPP_D8AF1KM_L3D.A2013281.h21v10.C1_03002.2013289183907.hdf.)

Table 1: Summary of fire products produced at the Land PEATE

Product	Type/ format	Resolution	Found in Archive Sets	Notes
NPP_AVAF_L2	Level 2, 1-D vector of fire pixels	750m	3000/IDPS, 3001/LPEATE, 3002/LPA	Several data fields not present if no fires in granule; IDPS OPS algorithm
NPP_VAFIP_L2	Level 2, 2-D fire mask swath pixel array	750m	3001/LPEATE, 3002/LPA	Same data as NPP_AVAF_L2; IDPS OPS algorithm
NPP_VAFIRE_L2D	Level 2, 2-D fire mask swath pixel array	750m	3001/LPEATE	Science Team algorithm (based on MODIS C6)
NPP_DVAF1KD_L2GD	Level 2G grid/ tile (multiple data layers)	1km	3001/LPEATE, 3002/LPA	Daily, daytime only. Generated from NPP_VAFIP_L2.
NPP_DVAF1KN_L2GD	Level 2G grid/ tile (multiple data layers)	1km	3001/LPEATE, 3002/LPA	Daily, nighttime only. Generated from NPP_VAFIP_L2.
NPP_DAF1KM_L3D	Level 3 grid/ tile	1km	3001/LPEATE, 3002/LPA	Daily. Generated from NPP_DVAF1KD_L2GD and NPP_DVAF1KN_L2GD
NPP_D8AF1KM_L3D	Level 3 grid/ tile	1km	3001/LPEATE, 3002/LPA	8- day composite Generated from NPP_DVAF1KD_L2GD and NPP_DVAF1KN_L2GD

Table 2: NPP fire products and MODIS equivalents (MOD for Terra and MYD for Aqua)

Description	NPP product	MODIS equivalent
Level 2 Active Fire pixel list (one-dimensional) from IDPS algorithm	NPP_AVAF_L2	None
Level 2 Active Fire mask (two- dimensional) from IDPS algorithm	NPP_VAFIP_L2	MOD14/ MYD14 (C4)
Level 2 Active Fire mask (two- dimensional) from Science Team algorithm	NPP_VAFIRE_L2D	MOD14/ MYD14 (C6)
Level 2G Active Fire mask, day	NPP_DVAF1KD_L2GD	MOD14GD/ MYD14GD
Level 2G Active Fire mask, night	NPP_DVAF1KN_L2GD	MOD14GN/ MYD14GN
Level 3 daily Active Fire mask	NPP_DAF1KM_L3D	MOD14A1/ MYD14A1 (but only 1 day of data in each data file)
Level 3 8- day composite Active Fire mask	NPP_D8AF1KM_L3D	MOD14A2/ MYD14A2

Figure 3: Interdependencies of NPP/ VIIRS fire products

NPP PRODUCT FILE SPECIFICATIONS

NPP_DVAF1KN_L2G(AS3001)

Dimensions:

YDim:NPP_Grid_L2g_2d
XDim:NPP_Grid_L2g_2d
Total Additional Observations
Data Rows

Variables:

byte fireMask_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "fire mask - first layer"
units = "bit field"

0 = "missing input data"
1 = "not processed (obsolete)"
2 = "not processed (obsolete)"
3 = "water"
4 = "cloud"
5 = "non-fire"
6 = "unknown"
7 = "fire (low confidence)"
8 = "fire (nominal confidence)"
9 = "fire (high confidence)"

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte1_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "fire mask QCFlags Byte 1 - first layer"
units = "bit field"

FILL_VALUES = "NA_UINT8_FILL = 255,
MISS_UINT8_FILL = 254

ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte2_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "fire mask QCFlags Byte 2 - first layer"
units = "bit field"

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte3_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "fire mask QCFlags Byte 3 - first layer"
units = "bit field"

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte4_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "fire mask QCFlags Byte 4 - first layer"
units = "bit field"

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253

ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249,
SOUB_UINT8_FILL = 248"

long FP_line_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "granule line of fire pixel - first layer"
units = "none"
valid_range = 0, 32767
FillValue = 0

long FP_sample_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "granule sample of fire pixel - first layer"
units = "none"
valid_range = 0, 32767
FillValue = 0

byte FP_QualFlag1_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "QualFlag1 - first layer"
units = "bit field"
valid_range = 0, 255

byte FP_QualFlag2_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "QualFlag2 - first layer"
units = "bit field"
valid_range = 0, 255

byte FP_QualFlag3_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "QualFlag3 - first layer"
units = "bit field"
valid_range = 0, 255

byte FP_QualFlag4_1(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "QualFlag4 - first layer"
units = "bit field"
valid_range = 0, 255
FillValue = '\0'

byte num_observations(YDim:NPP_Grid_L2g_2d, XDim:NPP_Grid_L2g_2d)
long_name = "Number of Observations"
units = "none"
valid_range = 0, 127
FillValue = -1

byte fireMask_c(Total Additional Observations)
long_name = "fire mask - additional layer, compact"
units = "bit field"

0 = "missing input data"
1 = "not processed (obsolete)"
2 = "not processed (obsolete)"
3 = "water"
4 = "cloud"
5 = "non-fire"
6 = "unknown"
7 = "fire (low confidence)"
8 = "fire (nominal confidence)"
9 = "fire (high confidence)"

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251, ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte1_c(Total Additional Observations)
long_name = "fire mask QCFlags Byte 1 - additional layer, compact"
fireMask_QCFlags_byte1_c:units = "bit field”

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250

VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte2_c(Total Additional Observations)
long_name = "fire mask QCFlags Byte 2 - additional layer, compact"
fireMask_QCFlags_byte2_c:units = "bit field"
fireMask_QCFlags_byte2_c:valid_range = '\0', '\377'
fireMask_QCFlags_byte2_c:_FillValue = '\0'

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250,
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte3_c(Total Additional Observations)
long_name = "fire mask QCFlags Byte 3 - additional layer, compact"
units = "bit field"

FILL_VALUES = "NA_UINT8_FILL = 255,
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

byte fireMask_QCFlags_byte4_c(Total Additional Observations)
long_name = "fire mask QCFlags Byte 4 - additional layer, compact"
units = "bit field"

FILL_VALUES = "NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254,
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251

ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248"

long FP_line_c(Total Additional Observations)
long_name = "granule line of fire pixel - additional layer"
units = "none"
valid_range = 0, 32767

long FP_sample_c(Total Additional Observations)
long_name = "granule sample of fire pixel - additional layer"
units = "none"
valid_range = 0, 32767

byte FP_QualFlag1_c(Total Additional Observations)
long_name = "QualFlag1 - additional layer"
units = "bit field"

byte FP_QualFlag2_c(Total Additional Observations)
long_name = "QualFlag2 - additional layer"
units = "bit field"

byte FP_QualFlag3_c(Total Additional Observations)
long_name = "QualFlag3 - additional layer"
units = "bit field"

byte FP_QualFlag4_c(Total Additional Observations)
long_name = "QualFlag4 - additional layer"
units = "bit field"

long nadd_obs_row(Data Rows)
long_name = "Number of additional observations per row"
units = "none"
valid_range = 0, 2147483647
FillValue = -1